

Habitat Use of the Watercress Darter (*Etheostoma nuchale*): An Endangered Fish in an Urban Landscape

R. Scot Duncan^a, Chad P. Elliott^a, Brook L. Fluker^{b,1}, and Bernard R. Kuhajda^b

^aBiology Department, Birmingham-Southern College, Box 549022, 900 Arkadelphia Road, Birmingham, Alabama 35254

^bDepartment of Biological Sciences, The University of Alabama, Box 870345, Tuscaloosa 35487

¹Corresponding author: e-mail: blfluker@crimson.ua.edu; Office: (205) 348-5828; FAX: (205) 348- 6460

Abstract

The federally endangered watercress darter (*Etheostoma nuchale*) is restricted to only five springs within the greater Birmingham (AL) metropolitan area. Restricted range, subpopulation isolation and threats from the urban landscape are the major factors endangering the species. The preferred habitat of *E. nuchale* has been described as the deeper, slow-moving portions of spring pools with dense aquatic vegetation, but its habitat use patterns have not been carefully studied. Because the long-term survival of *E. nuchale* will likely depend on the protection and restoration of suitable habitat, more needs to be known about its preferred habitats. We studied habitat use patterns of *E. nuchale* and the geomorphologic and environmental conditions associated with these habitats in Seven Springs, a population recently discovered in 2003. Geomorphology and vegetation were surveyed throughout the spring pool and the spring run connecting it to the nearest tributary. Fish were surveyed via seining in eight distinct habitats. We found that *E. nuchale* can use a greater diversity of habitats than previously appreciated, including both shallow and non-vegetated habitats. While densities of adult fish were higher in vegetated habitats, fish of all ages and sexes were found in non-vegetated habitats where structural diversity is provided by detritus or gravel. Males were most abundant in mats of aquatic moss, while females showed no strong habitat associations other than avoiding habitats with no shelter. Juveniles were mainly associated with aquatic moss and pools with detritus. The best conditions for in-stream vegetation favored by *E. nuchale* were in the spring pool where the channel was broad, the current slow and shallow margins were extensive. Our findings suggest that habitat conservation plans that reduce storm water runoff and increase streambed and riparian stability, specifically in habitats downstream of springs that house *E. nuchale*, could promote aquatic vegetation growth and structural diversity, thus expanding the species usable habitat.

Received: May 14, 2009; **Accepted:** October 19, 2009

Literature Cited

- Gorman, O. T. and J. R. Karr. 1978. Habitat structure and stream fish communities. *Ecology* 59:507–515
- Howell, W. M. 1988. A proposal to transplant specimens of the endangered watercress darter, *Etheostoma nuchale* (Pisces: Percidae) to other suitable springs. Final report on cooperative agreement no. 14-16-0004-85-943 between U.S. Fish and Wildlife Service and the State of Alabama, Department of Conservation and Natural Resources. 3 p. Available from: U.S. Fish and Wildlife Service, Jackson, Mississippi.
- Howell, W. M. and A. Black. 1976. Status of the Watercress Darter. *Southeast. Fish. Coun. Proc* 1 (3):1–3.
- Howell, W. M. and R. D. Caldwell. 1965. *Etheostoma* (Oligocephalus) *nuchale*, a new darter from a limestone spring in Alabama. *Tulane Stud. Zool* 12 (4):101–108.
- Kuhajda, B. R. 2003. South-central regional report. *Southeast. Fish. Coun. Proc* 45:19–24.
- Lang, N. J. and R. L. Mayden. 2007. Systematics of the subgenus *Oligocephalus* (Teleostei: Percidae: *Etheostoma*) with complete subgeneric sampling of the genus *Etheostoma*. *Mol. Phylogenet. Evol* 43:605–615.
- Mayden, R. L., K. E. Knott, J. P. Clabaugh, B. R. Kuhajda, and N. J. Lang. 2005. Systematics and population genetics of the coldwater (*Etheostoma ditrema*) and watercress (*Etheostoma nuchale*) darters, with comments on the gulf darter (*Etheostoma swaini*) (Percidae: subgenus *Oligocephalus*). *Biochem. Syst. Ecol* 33:455–478.
- McCaleb, J. E. 1973. Some aspects of the ecology and life history of the pygmy sculpin, *Cottus pygmaeus* Williams, a rare spring species of Calhoun County, Alabama (Pisces: Cottidae). M.S. Thesis. Auburn University. Auburn, Alabama. 82 p.
- (NWS) National Weather Service 2008. 2007 weather year in review. NWS Forecast Office. Birmingham, Alabama.
- Ramsey, J. S. and R. D. Suttkus. 1965. *Etheostoma ditrema*, a new darter of the subgenus *Oligocephalus* (Percidae) from springs of the Alabama River Basin in Alabama and Georgia. *Tulane Stud. Zool* 12 (3):65–77.
- Seesock, W. E. 1979. Some aspects of the life history of the coldwater darter, *Etheostoma ditrema*, from Glencoe Spring, Etowah County, Alabama. M.S. Thesis. Auburn University. Auburn, Alabama. 70 p.
- Stiles, R. A. 2004. Watercress Darter, *Etheostoma nuchale*. 192–193. In: Mirarchi, R. E., J. T. Garner, M. F. Mettee, and P. E. O'Neil. (eds.). Alabama Wildlife, Volume 2, Imperiled aquatic mollusks and fishes. The University of Alabama Press. Tuscaloosa. 255 p.
- (USFWS) U.S. Fish and Wildlife Service 1970. Endangered and threatened wildlife and plants; determination of *Etheostoma nuchale* (watercress darter) to be an endangered species. *Fed. Regist* 35 (199):16047.
- (USFWS) U.S. Fish and Wildlife Service 1992. Watercress Darter (*Etheostoma nuchale*) Recovery Plan. Jackson, Mississippi. 16 p.
- (USFWS) U.S. Fish and Wildlife Service 2006. Five-year review, Watercress Darter (*Etheostoma nuchale*). Jackson, Mississippi. 16 p.
- Walsh, C. J., A. H. Roy, J. W. Feminella, P. D. Cottingham, P. M. Groffman, and R. P. Morgan II. 2005. The urban stream syndrome: current knowledge and the search for a cure. *J. N. Am. Benthol. Soc* 24:706–723.

Cited by

Michael A. Alcorn¹, Jennifer Deitloff^{1,3}, Sean P. Graham¹, and Elizabeth K. Timpe⁵. (2013) Sexual Dimorphism in Head Shape, Relative Head Width, and Body Size of *Eurycea aquatica* and *Eurycea cirrigera*. *Journal of Herpetology* 47:2, 321-327

Brook L. Fluker, Bernard R. Kuhajda, Nicholas J. Lang, Phillip M. Harris. (2010) Low genetic diversity and small long-term population sizes in the spring endemic watercress darter, *Etheostoma nuchale*. *Conservation Genetics* 11:6, 2267-2279